**Section 5 a Extraction of metals**

**(from http://www.docbrown.info/page04/Y11revQs/ExtractFeAlCuQHT.htm**

**Extraction of iron in the blast furnace**

**(a)**  List and describe the four principal **raw materials** (including air) which are used in the blast furnace.  Carefully **explain the function** of each raw material used.

**(b)**  Draw a **diagram** to show the **outline** of the structure of a **blast furnace** and mark on it the following labels: hot air,  raw materials (ore, coke, limestone),  hot waste gases ,  reaction zone, melting zone, slag,  molten iron tapped off.

**(c)** Describe, with the help of word/symbol equations, the **four chemical reactions** for the various stages of the process.

**(d)**  (ii) Describe some of the potential pollution problems from a blast furnace and how they might be reduced.  (ii) What can be done with waste heat from the furnace?

**(e)**  the limestone reaction to remove silica impurities occurs in two stages (some texts combine these equations to give **CaCO3** + **SiO2** ==> **CaSiO3** + **CO2**

**(1)  CaCO3** ==> **CaO + CO2** then**(2) CaO + SiO2** ==> **CaSiO3**

    What **type of reaction** is **(1)?**

**(2)** If calcium oxide is a basic oxide, what sort of oxide is silicon dioxide?

    Why do they react together and what sort of compound is calcium silicate?

**(f)** **Carefully explain** why reaction for stage 3: iron(III) oxide + carbon monoxide ==> …. is an example of a **REDOX** reaction i.e. it involves an oxidation and a reduction.

**(g)** (i) State what is **oxidised** in the reaction for stage 1.   (ii) State what is **oxidised**, and to what, **and** what is **reduced**, and to what, in the reaction for stage 2

**(h)** Other mineral oxides of iron can be used in a blast furnace e.g.  iron(II) oxide **FeO**  and tri-iron tetroxide  **Fe3O4**

Give **balanced symbol equations** for the following word equations …

(1) iron(II) oxide + carbon ==> iron + carbon dioxide

(2) tri-iron tetroxide + carbon ==> iron + carbon dioxide

(3) tri-iron tetroxide + carbon monoxide ==> iron + carbon dioxide

**(I)** Describe several uses of iron including steel.

**Extraction of aluminium**

**(a)**  What is the main **ore** of aluminium **called**? What is the **name and formula** of the principal **aluminium compound** in it?

**(b)** Aluminium is extracted from its ore by **electrolysis**.  What does this **mean**?

**(c)** Sketch in outline the **electrolysis cell**, add **labels** to show:  bauxite input, carbon anodes (+),  electricity supply,  aluminium output, carbon cathode (-), waste gases

**(d) Questions on the electrolysis process:**

(1)   Why is **cryolite** added to the bauxite ore in the electrolysis cell?

(2)   Why is it **expensive** to produce aluminium by this method?

(3)   Give the **names and symbols** of the two **ions** free to move in the molten ore. Where and why do theses ions move to?

(4)   Give the **two electrode equations** to show the formation of aluminium at the cathode(-) and oxygen at the anode(+). Explain the changes in terms of oxidation and reduction

(5)   Why do the carbon **anodes** have to be **replaced regularly**? Is there any danger of a toxic gas being produced?

(6)   Is the electrolysis of molten aluminium oxide an **exothermic or endothermic** chemical change and **explain** your answer.

**(e) The uses of aluminium**

(1)   Describe some **everyday uses** of aluminium.

(2)   Give two good **reasons** for **recycling** aluminium cans.

(3)   Why should aluminium **not be used for water pipes**?  [aluminium saucepans are out of favour too!]

(4)   Give **three** good **reasons** for using aluminium **alloys** for **aircraft wings.**

(5)   Aluminium is used for window frames but theoretically it is reactive enough to corrode away fairly rapidly.  Explain why this does not happen.